January 3, 2023

Ryan Bares
Utah Division of Air Quality
195 N 1950 W
Salt Lake City, Utah 84116

Re: Stakeholder Cost Analysis for Blue Smoke and Oil Storage Tank Controls

Dear Mr Bares

The purpose of the technical memorandum (TM) is to provide public comment to the Utah Division of Air Quality (UDAQ) on the proposed rule R307-313 (proposed rule) Volatile Organic Compounds (VOC) and Blue Smoke Controls for Hot Mix Asphalt (HMA) Plants. This TM focuses on my internal best available control technology (BACT) analysis to implement control technologies on blue smoke and oil storage tank at a hot mix asphalt facility required by the proposed rule.

Introduction

The proposed rule will require all HMA plants and associated oil storage tanks in Salt Lake, Davis, Weber, Utah, and Tooele to implement controls to mitigate blue smoke and VOC releases to the atmosphere. This TM provides a summary of my BACT analysis for both blue smoke and oil storage tank controls which was completed in accordance with UDAQ BACT analysis guidance. Provided in this TM is a comparison between the UDAQ and my BACT analysis for UDAQ consideration. Please note that it is my hope that this TM (1) clearly presents my BACT analysis approach and results, (2) identifies potential discrepancy between each BACT analyses, and (3) allows a more detailed discussion and considerations around the proposed Rule R307-313. Please don't hesitate to reach out for clarification, as needed.

UDAQ Cost Analysis Summary

UDAQ provided stakeholders a summary of their cost analysis to implement the required control under the proposed rule (**Attachment A**). Note that the costs provided by the UDAQ in Attachment A does not appear to be an actual BACT analysis but rather a cost summary breakdown. The UDAQ provided values in Attachment A were used to create or recreate a UDAQ BACT analysis. Below is a high-level summary of the UDAQ provide costs, including assumptions.

- Estimated Blue-Smoke Controls Costs per HMA plant
  - Equipment & Install Cost: $339,675
  - Annual Operation and Maintenance (O&M) Cost: $15,100
- Estimated Oil Storage Tank Controls Costs per HMA plant
  - Equipment & Install Cost: $171,400
  - Annual O&M Cost: $4,000
- Cost per ton VOC reduction
  - Blue-Smoke Control: $6,197
  - Oil Storage Tank Control: $2,052
- Assumptions
  - 35-year life expectancy of controls equipment

- 70- and 90-percent VOC reduction for blue-smoke and oil storage tank controls, respectively
- ***No interest applied to calculate annualized cost***

Stakeholder BACT Analysis Summary and Results

As mentioned previously, the purpose of the Stakeholder BACT analysis is twofold: (1) provide an understanding what the anticipated cost to implement the required controls will be for a standard HMA plant, and (2) evaluate and compare Stakeholder cost analysis with the provided Utah UDAQ cost analysis. **Table 1** provides a summary and comparison of the Stakeholder and recreated UDAQ BACT analyses. Note that the UDAQ BACT analysis was conducted by me based on the UDAQ provided values in Attachment A.

The stakeholder BACT analysis assumptions included the following:

(1) Straight-line depression on all control equipment over 10 years (industry standard)
(2) 70- and 90-percent VOC reduction for blue-smoke and oil storage tank controls (same as UDAQ)
(3) 6-percent interest rate was applied (10-year period)
(4) Facility X 2020 emission inventory VOC results used in analysis

Annualized Cost.

An annualized cost was calculated based on the UDAQ BACT analysis guidance. There were two significant differences between the stakeholder and UDAQ annualized cost analyses: (1) equipment life expectancy and applied interest rate. UDAQ applied a 35-year life expectancy, and a 10-year life expectancy was applied to the stakeholder analysis, which is general industry standard. UDAQ did not apply an interest rate and a 6-percent interest rate was applied to the stakeholder analysis.

Blue Smoke Controls: The annualized equipment cost (dollars per year) for the stakeholder and UDAQ analyses were $79,021 and $24,805, respectively. This is a difference of 69-percent. The annualized cost (dollars per ton of pollutant removed) for the stakeholder and UDAQ analyses were $29,694 and $5,715, respectively. This is a difference of 81-percent.

Oil Storage Tank Controls: The annualized equipment cost (dollars per year) for the stakeholder and UDAQ analyses were $28,131 and $8,897, respectively. This is a difference of 68-percent. The annualized cost (dollars per ton of pollutant removed) for the stakeholder and UDAQ analyses were $7,421 and $1,816, respectively. This is a difference of 76-percent.

Normalized Annualized Cost.

If one assumes the same equipment life expectancy (10-years), interest rate (6-percent), and emission reduction (4.3 tons per year for blue smoke controls and 7.1 for oil storage tank controls) the annualized costs are as follows.

Blue Smoke Controls: The normalized annualized equipment cost (dollars per year) for the stakeholder and UDAQ analyses were $79,021 and $46,151, respectively. This is a difference of 42%. The normalized annualized cost (dollars per ton of pollutant removed) for the stakeholder and UDAQ analyses were $22,098 and $14,244, respectively. This is a difference of 36-percent.

Oil Storage Tank Controls: The normalized annualized equipment cost (dollars per year) for the stakeholder and UDAQ analyses were $28,131 and $23,288, respectively. This is a difference of 17-

percent. The normalized annualized cost (dollars per ton of pollutant removed) for the stakeholder and UDAQ analyses were $4,807 and $3,842, respectively. This is a difference of 20-percent.

Discussion

The comparison of BACT analyses highlights some discrepancies between the stakeholder and UDAQ analyses. The primary discrepancies are provided equipment cost, differences in annual emission reduction, application of an interest rate in the annualized cost analyses, and a difference in equipment life expectancy.

One can expect a difference in a manufacturer provided equipment cost as each facility is unique and will require specific equipment to meet facility demands.

Regarding the estimated annual emission reduction (tons per year) provided by the UDAQ for the oil storage tank facilities, this is likely biased high as it was calculated by dividing the calculate annual tank emissions (tons per year) of all oil storage facilities by the total number of facilities. This annual emission reduction is likely biased higher than actuality due one facility (which is a large oil storage tank farm) contributing more tons per year than all other oil storage facilities. Thus, biasing the estimated annual emission reduction high and in turn, artificially reducing the annualized equipment costs and annualized costs.

Standard equipment life expectancy in the construction industry is 10-years. Thus, the difference in UDAQ's assumed equipment life expectancy (i.e., 35-years) versus 10-year significantly impact the calculated annualized costs (**Table 1**).

Lastly, the absence of applying interest to calculate the annualized equipment costs and thus the annualized costs of the BACT analysis is not representative of real-world costs. It is reasonable to assume that most stakeholder will not be paying cash to implement these controls but will rather financing them over x-number of years. By not applying an interest rate to the cost analysis, the overall cost to the stakeholder to implement these controls is not a realistic representation of the actual cost to the stakeholder but rather provides an artificially low overall annualized cost.

Conclusion

In conclusion, based on the results of the Stakeholder and UDAQ BACT analysis, there appears to be some significant discrepancies. The primary discrepancies identified are:

- Equipment life expectancy. Stakeholder assumed a 10-year straight-line depreciation on all purchased equipment and based it's assumed equipment life expectancy for this analysis on this timeframe. UDAQ assume a 35-year equipment life expectancy.
- Likely biased high emission reduction of oil storage tank controls
- An interest rate was not considered in the UDAQ analysis.

Clarification from the UDAQ regarding these discrepancies would be appreciated.

Regards,

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Tables

BACT - HMA Facility Blue Smoke and Oil Storage Tank Controls

Granite Construction Company

		Annualized Cost ($/ton pollutant removed)[(A)]	Annualized Equipment Cost ($/yr)[(B)]	Equipment & Installation Cost ($)	Interest Rate (%)[(i)]	Equip. Life Expectancy (yr)[3, (n)]	Annual Operation Cost ($)[(C)]	Emission Reduction (tons/yr)[4, (D)]
Blue Smoke	Stakeholder	$29,694	$79,021	$581,600	6%	10	$16,000	3.2
	UDAQ[1]	$5,715	$24,805	$339,675	0%	35	$15,100	4.3
	Delta	81%	69%	42%	--	--	6%	--
	Stakeholder (normalized)[2]	$22,098	$79,021	$581,600	6%	10	$16,000	4.3
	UDAQ (normalized)[2]	$14,244	$46,151	$339,675	6%	10	$15,100	4.3
	Delta	36%	42%	42%	--	--	6%	--
Oil Storage Tanks	Stakeholder	$7,421	$28,131	$207,050	6%	10	$6,000	4.6
	UDAQ[1]	$1,816	$8,897	$171,400	0%	35	$4,000	7.1
	Delta	76%	68%	17%	--	--	33%	--
	Stakeholder (normalized)[2]	$4,807	$28,131	$207,050	6%	10	$6,000	7.1
	UDAQ (normalized)[2]	$3,842	$23,288	$171,400	6%	10	$4,000	7.1
	Delta	20%	17%	17%	--	--	33%	--

NOTES

BACT analysis was completed based on UDAQ guidance; Cost Calculation for Control Equipment

[1] UDAQ provided number 11/22/2023 (Attachment A); assumed interest rate of zero

[2] Assumed same interest rate, equipment life expectancy, and emission reduction between UDAQ and Stakeholder.

[3] Granite Construction Company assumes a 10-year straightline depreciation on all purchased equipment.

[4] 2020 emission inventory results from Stakeholder HMA facility were used. UDAQ annual emissions were back calculated from the number of facilities to be regulated under this new regulation. UDAQ annual emission reduction likely baised higher than most stakeholders due to the inclusion of an oil storage tank farm that emitted more than the average HMA facility.

(A) Annualized cost expressed in dollars per ton of pollutant removed.

(B) Annualized equipment cost in $/yr = $PV\{i/[1-(1+i)^{-n}]\}$

(C) Annual operating cost is the sum of the cost for spare parts, power, labor, maintenance, etc., less the value for the amount of reclaimed product or by product recovered and used or sold.

(D) The amount of emission reduction due to the installation and operation of the pollution control equipment in tons/year.

$ = Dollars
% = percent
i = Interest rate
n = Number of years of the life of equipment

BACT = Best available control technology
HMA = Hot mix asphalt
UDAQ = Utah Department of Air Quality
yr = Year

Attachment A

UTAH DEPARTMENT of ENVIRONMENTAL QUALITY
AIR QUALITY

Hot Mix Asphalt Cost of Controls Overview
Proposed Rule: R307-313

Identifying Sources

All Hot Mix Asphalt (HMA) facilities are required to report to the State and Local Emissions Inventory System (SLEIS), since they operate equipment that falls under New Source Performance Standards (NSPS) I (for HMA plants). Sources were selected from the SLEIS system by North American Industry Classification System (NAICS) code or by relevant Source Classification Code (SCC).

Sources were identified from the following five NAICs codes:

- 212319 (Other Crushed and Broken Stone Mining and Quarrying),
- 212321 (Construction Sand and Gravel Mining),
- 237310 (Highway, Street, and Bridge Construction),
- 324121 (Asphalt Paving Mixture and Block Manufacturing), and
- 333120 (Construction Machinery Manufacturing).

Sources were identified from the following seven SCCs:

- 30500205 (Drum Dryer: Drum Mix Plant),
- 30500245 (Batch Mix Plant: Hot Elevators, Screens, Bins, Mixer & NG Rot Dryer),
- 30500255 (Drum Mix Plant: Rotary Drum Dryer/Mixer, Natural Gas-Fired),
- 30500257 (Drum Mix Plant: Rotary Drum Dryer/Mixer, Natural Gas, Counterflow),
- 30500212 (Heated Asphalt Storage Tanks),
- 40301022 (Asphalt Oil: Breathing Loss), and
- 40301099 (Other Product: Working Loss).

After potential sources were identified, permits were checked to verify that the relevant equipment was permitted at the site.

Emission Calculation Methodology

To estimate the impact of blue smoke controls at HMA plants, site-specific data was used wherever it was available. Where site-specific data was not available, a VOC emission factor of 0.032 lbs per ton of HMA[1] was used to estimate 2017 and 2020 emissions in most cases.

To estimate Potential To Emit (PTE) totals, permit applications were reviewed for equipment-specific numbers. If permit applications were not available in an electronic form, the following formulas were used:

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[1]AP-42 Chapter 11.1 Hot Mix Asphalt Plants.

- Facility HMA production maximum in published permits multiplied by VOC emission factor and divided by 2,000 to estimate PTE tonnage.
- If HMA production maximum was unavailable, the average VOC tonnage at other sites (per HMA plant) was used, multiplied by the number of HMA plants on-site.

No AP-42 emission factor exists for asphalt tanks, as tank emissions are calculated based on specific inputs, such as temperature, fuel type, tank height and diameter, and others. As a result, 2017 and 2020 emissions were based on estimates derived from SLEIS. For PTE calculations, permit applications were reviewed for equipment-specific numbers. If permit applications were not available, an average of other sites was calculated (for one tank), and multiplied by the number of tanks at a given site.

Available permit applications were reviewed for equipment quantities, then cross-checked against current permits and SLEIS data to produce the most accurate and up-to-date number for pieces of equipment.

To project emissions for the attainment year of 2023, REMI projection factors were used in accordance with the steps used for the current 2015 Moderate Ozone State Implementation Plan. All facilities had detailed 2020 reports, thus 2020 was set as the default base year. Projections were carried out normally for projection year 2023 without controls, but percentages of emissions were removed from projection year 2023 with controls on HMA plants and asphalt tanks. UDAQ assumed a 90% control rate for asphalt tanks and 70% for HMA plants based on conversions with control manufacturers and internal review of available emission reduction testing results.

Cost of Controls

For blue smoke controls, estimated initial costs are as follows:

- Blue smoke control system: $215,000.
- Fan controls: $13,975
- Inlet headers: $10,200
- Two air-actuated butterfly dampers: $4,800
- Strip curtain enclosures: $2,825
- Silo and tunnel ducting: $44,500
- Installation: $48,375
- **Total Initial Costs: $339,675**

Estimated Annual Costs:

- Five replacement stage 4 filters: $100/yr
- 20 replacement filters for stages 5-7: $15,000/yr
- **Total Annual Costs: $15,100/yr**

An expected lifetime of 35 years for this control was assumed. The total initial cost of $339,675 spread across a life expectancy of 35 years equals $9,705 per year. When added to the estimated annual cost of $15,100, the estimated annualized cost of controls is **$24,805**.

For tank controls, the estimated initial costs are as follows:

- Carbon absorption collector: $108,560
- Blower controls: $4,150
- Ducting: $28,690
- Installation: $30,000
- **Total Initial Costs: $171,400**

Estimated Annual Costs:

- Stage 2 filter $700
- Five stage 3 filters $100/yr
- Stage 4 carbon filter $1,600
- Stage 5 carbon bed $1,600
- **Total Annual Costs: $4,000**

The total initial cost of $171,400, divided by an expected lifetime of 35 years and added to estimated annual maintenance costs produces an annualized cost of **$8,897.14**.

Final Estimates

Based on the PTE estimates and annualized cost of controls, DAQ estimates that:

- Blue smoke controls could prevent 52.08 tons of VOC from entering the atmosphere from 12 HMA units in the nonattainment area at an annualized cost per ton of **$5,714.95**.
- Tank controls could prevent a maximum of 102.66 tons of VOC from 145 tanks at 13 facilities in the nonattainment area at a cost per ton of VOC at **$2,094.38** (one control device can operate up to 6 tanks).